Design Engineering

ISSN: 0011-9342
Issue: 4 | Pages: 158 - 168

2D Synthetic Data Sets From Images for Deep Learning in Computed Tomography

M.S.M. Yusoff[*,1], R. Sulaiman[1], S. Kamarudin[2], F. Ramli[3]

[1]Institut IR 4.0, National University of Malaysia (UKM), 43600 Bangi, Selangor, Malaysia.

[2]Faculty of Computer Science and Information Technology, Universiti Putra Malaysia (UPM), 43400 UPM Serdang, Selangor, Malaysia.

[3]Faculty of Computer Science and Information Technology, Universiti Malaysia Sarawak (UNIMAS), 94300 Kota Samarahan, Sarawak, Malaysia.

*E-mail address of the corresponding author: soyapi81@gmail.com

ABSTRACT:

The study investigated computer-generated synthetic data setsfor use in reconstructing images in computed tomography. The data sets of computed tomography were in the format of forward projection. The present study focused on transforming a normal image data set to those of a forward projection data set. The method used to transform the normal image data set to a forward projection data set was Radon transformation. Forward projection data sets are also called sinogram data sets or the output of computed tomography data acquisition systems. The experiment was conducted using both grayscale and colour images. The time taken for the completion of the image reconstruction was measured and recorded in a table. The images from the synthetic data sets of computed tomography were plotted side by side with the original image. The synthetic data sets using forward projection data sets could be transformed back to their original image form through the application of inverse Radon transformation. This technique is known as backwards projection.

KEYWORDS: - *Tomography, synthetics dataset, phantom, projection, attenuation, simulation*

I. INTRODUCTION

This paper concernscomputer-generated synthetic data sets for use to reconstruct images for computed tomography (CT). The exploitation of synthetic data sets in computed tomography has a long history spanning many years. Data generators have been used to produce synthetic data sets for analysis in machine learning and data visualization(Mendonça et al. 2020).

Synthetics data sets are computer-generated data setswhich contain similar measurements and numerical properties, this data can then be applied to mimic the real world data sets of a study domain (K Sree Kumar 2020). Researchers used synthetics data sets for seismic analysis(Stekl et al. 2008), behavioral sciences(Quintana 2020), information visualization (Brito et al. 2018), deep learning (Toda et al. 2020), socio-spatial systems (Raimbault 2019) and financial studies(Gan & Valdez 2017).

II. BACKGROUND

The synthetic datasets for computed tomography are classified into two categories. These two categories are syntheticdata setswhich aregenerated froma simulation of mathematical calculation andsyntheticsdata setswhich areacquiredthrough the action of scanning physical phantom objects.The computationalproperties of synthetic data sets using mathematical equations donot involve the use of a